General

Guideline Title

Nursing management of adults with severe traumatic brain injury.

Bibliographic Source(s)

American Association of Neuroscience Nurses. Nursing management of adults with severe traumatic brain injury. Glenview (IL): American Association of Neuroscience Nurses; 2008. 20 p. [152 references]

Guideline Status

This is the current release of the guideline.

The American Association of Neuroscience Nurses reaffirmed the currency of this guideline in December 2012.

Recommendations

Major Recommendations

The levels of evidence (Class I-IV) supporting the recommendations and levels of recommendation (Level 1-3) are defined at the end of the "Major Recommendations" field.

Recommendations (see algorithm in Figure 1 of the original guideline document)

Maintaining or Decreasing Intracranial Pressure (ICP)

1. Maintaining ICP at less than 20 mm Hg improves outcomes. (Level 1)
2. Draining cerebrospinal fluid (CSF) decreases ICP. (Level 2)
3. Do not induce hyperventilation to decrease ICP. (Level 2)
4. Administering sedation prevents ICP increases. (Level 2)
5. Administering mannitol is effective in decreasing ICP. (Level 2)
   The diuretic effect of mannitol can cause increased sodium and serum osmolarity levels, and should be monitored at regular intervals.
6. Elevate the head of the bed (HOB) 30 degrees to maintain or decrease ICP. (Level 2)
7. Removing or loosening rigid cervical collars may decrease ICP. (Level 3)
8. Administering intensive insulin therapy may reduce ICP. (Level 3)
9. Maintaining normothermia may prevent ICP increases. (Level 2)

Controversial Treatments for Refractory Intracranial Hypertension

1. Inducing moderate hypothermia may decrease ICP in refractory intracranial hypertension. (Level 2)
2. Administering hypertonic saline may decrease ICP in refractory intracranial hypertension. (Level 3)
   Sodium levels and urine output require close monitoring.
3. Administering high-dose barbiturates may decrease ICP in refractory intracranial hypertension. (Level 3)
   When using this treatment paradigm, continuous electroencephalogram (EEG) monitoring or a bispectral index monitor should be used to guide this dose-dependent therapy. Hemodynamic stability must be achieved before instituting high-dose barbiturates.
4. Hyperventilation rapidly decreases ICP in emergent intracranial hypertension. (Level 3)
   In the event this ICP therapy technique is used, advanced monitoring techniques such as jugular venous oxygen saturation or brain tissue oxygenation should be considered to ensure adequate substrate delivery to the vulnerable brain.

Maintaining Adequate Cerebral Perfusion Pressure (CPP) or Increasing CPP

1. Maintaining CPP between 50â€“70 mm Hg optimizes cerebral perfusion. (Level 2)
   A general threshold of 60 mm Hg may be appropriate with further fine-tuning based on multimodality monitoring.
2. Administering norepinephrine may maintain adequate CPP or increase CPP. (Level 3)
   Catecholamines can cause negative side effects such as skin ulcers and decreased blood flow to renal and mesenteric circulations, especially with prolonged use at high doses.
3. Elevating the HOB 0â€“30 degrees may maintain adequate CPP or increase CPP. (Level 3)
4. CSF drainage may be an effective treatment for low CPP. (Level 3)

Monitoring Modalities

1. Continuous ICP monitoring and display successfully guide nursing interventions. (Level 2)
2. Continuous CCP monitoring and display may successfully guide nursing interventions. (Level 3)
3. Continuous brain tissue oxygen ($PbtO_2$) monitoring and display may successfully guide nursing interventions. (Level 3)
4. Monitoring and displaying brain temperature may successfully guide nursing interventions. (Level 3)

Preventing Deep Venous Thrombosis (DVT)

1. Pharmacologic treatment may be safe for DVT prophylaxis. (Level 3)
2. Applying mechanical prophylaxis on admission may prevent DVT in patients who cannot receive immediate pharmacologic prophylaxis due to risk of bleeding (Level 3)

Adequate Nutrition

1. Initiating adequate nutrition within 72 hours of injury may improve outcomes. (Level 3)
2. Providing continuous intragastric feeding may improve tolerance. (Level 3)
3. Prokinetic agents have shown no effect on feeding tolerance. (Level 2)

Glycemic Control

1. Administering intensive insulin therapy for elevated serum glucose (greater than 110 mg/dL) can improve outcomes (Level 2).
   Subcutaneous insulin administration has been shown to be unsafe and less effective than intravenous insulin administration in critically ill patients.

Preventing Seizures

1. Administering antiepileptic drugs decreases the incidence of early posttraumatic seizures. (Level 2)
   Chronic prophylaxis should be avoided.
2. Electroencephalogram (EEG)Â technology may help to identify patients at risk for seizures. (Level 3)

Definitions:

Levels of Evidence Supporting the Recommendations

Class I: Randomized controlled trial without significant limitations or meta-analysis

Class II: Randomized controlled trial with important limitations (e.g., methodological flaws, inconsistent results); observational study (e.g., cohort, case control)

Class III: Qualitative study, case study, or series

Class IV: Evidence from reports of expert committees and/or expert opinion of the guideline panel, standards of care, and clinical protocols that have been identified

Levels of Recommendation (based upon evaluation of the available evidence)

Level 1: Recommendations are supported by class I evidence.

Level 2: Recommendations are supported by class II evidence.

Level 3: Recommendations are supported by class III and class IV evidence.

Clinical Algorithm(s)

The *Treatment Algorithm: Clinical Practice Guidelines for the Nursing Management of Adults with Severe Traumatic Brain Injury* is provided in the original guideline document.

Scope

Disease/Condition(s)

Severe traumatic brain injury

Guideline Category

Management

Prevention

Treatment

Clinical Specialty

Critical Care

Emergency Medicine

Neurological Surgery

Neurology

Nursing

Intended Users

Advanced Practice Nurses

Health Care Providers

Hospitals

Nurses

Guideline Objective(s)

To provide recommendations based on current evidence that will help registered nurses, intensive care unit personnel, and institutions provide safe and effective care to severely injured patients with traumatic brain injury (TBI)
To offer evidence-based recommendations on nursing activities that have the potential to maximize outcomes for severe TBI

Target Population

Adults with a brain injury incurred by a traumatic mechanism of injury with a resultant level of consciousness categorized by a Glasgow Coma Scale score of 8 or lower

Interventions and Practices Considered

- Maintaining or decreasing intracranial pressure (ICP)
  - Maintaining ICP at <20 mm Hg
  - Draining cerebrospinal fluid (CSF)
  - Maintaining normocapnia rather than inducing hyperventilation
  - Administering sedation
  - Administering mannitol
  - Elevating the head of the bed (HOB) to 30 degrees
  - Removing or loosening rigid cervical collars
  - Administering intensive insulin therapy
  - Maintaining normothermia
- Controversial treatments for refractory intracranial hypertension
  - Inducing moderate hypothermia
  - Administering hypertonic saline
  - Administering high-dose barbiturates
  - Hyperventilation
- Maintaining adequate cerebral perfusion pressure (CPP) or increasing CPP
  - Maintaining CPP between 50-70 mmHg
  - Administering norepinephrine
  - Elevation of the HOB 0-30 degrees
  - CSF drainage
- Monitoring modalities
  - Continuous ICP monitoring and display
  - Continuous CCP monitoring and display
  - Continuous brain tissue oxygen monitoring and display
  - Monitoring and displaying brain temperature
- Preventing deep venous thrombosis
  - Pharmacologic treatment
  - Mechanical prophylaxis
- Maintaining adequate nutrition
  - Early initiation of adequate nutrition
  - Continuous intragastric feeding
- Maintaining glycemic control through intensive insulin therapy
- Preventing seizures
  - Administering antiepileptic drugs
  - Monitoring the electroencephalogram

Note: Prokinetic agents were considered, but not recommended.

Major Outcomes Considered

Glascow Coma Scale score
Intracranial pressure
Cerebral perfusion pressure
Brainstem herniation
Complications of treatment
Deep venous thrombosis
Disability
Mortality
Duration of institutionalization

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

2008 Original Guideline

A computerized search of Medline and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) was performed using the names of specific nursing interventions with and without intracranial pressure (ICP) or cerebral perfusion pressure (CPP) as keywords. The search was primarily restricted to works in English published in 2000–2008 in which all or part of the sample included adults with severe traumatic brain injury (TBI). Few studies were found on certain nursing interventions. In these instances, the search was expanded to include the years 1997–1999 for relevant works. The reference lists of identified articles also were searched for additional studies.

2012 Reaffirmation

Medline/PubMed, CINAHL and Brain Trauma foundation guidelines were searched and reviewed from 2000 to December 2012.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Expert Consensus

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Levels of Evidence

Class I: Randomized controlled trial without significant limitations or meta-analysis

Class II: Randomized controlled trial with important limitations (e.g., methodological flaws, inconsistent results); observational study (e.g., cohort, case control)

Class III: Qualitative study, case study, or series

Class IV: Evidence from reports of expert committees and/or expert opinion of the guideline panel, standards of care, and clinical protocols that have been identified

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence

Two neurotrauma nursing experts determined the level of evidence for each study included under every recommendation, summarizing the level of evidence for each recommendation.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

2008 Original Guideline

The Clinical Practice Guidelines and recommendations for practice are established based upon the evaluation of the available evidence.

The guidelines address the following research questions:

- What nursing interventions maintain or decrease ICP in patients with severe TBI?
- What nursing interventions maintain adequate CPP or increase CPP in patients with severe TBI?
- What monitoring modalities can successfully guide nursing interventions in severe TBI?
- What nursing interventions prevent DVT in patients with severe TBI?
- What nursing interventions promote adequate nutrition in patients with severe TBI?
- What nursing interventions prevent hyperglycemia in patients with severe TBI?
- What nursing interventions prevent seizures in patients with severe TBI?

2012 Reaffirmation

The Editorial Board does an annual review of guidelines.

Rating Scheme for the Strength of the Recommendations

Levels of Recommendation

Level 1: Recommendations are supported by class I evidence.

Level 2: Recommendations are supported by class II evidence.

Level 3: Recommendations are supported by class III and class IV evidence.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

External Peer Review

Description of Method of Guideline Validation

Blinded external peer review was performed using established criteria for evaluation.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for all recommendations (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

The evidence presented here may help neuroscience nurses make appropriate choices when caring for patients with severe traumatic brain injury (TBI).
Appropriate management and treatment of patients with TBI may improve patient outcomes.

Potential Harms

The diuretic effect of mannitol can cause increased sodium and serum osmolarity levels, and should be monitored at regular intervals.
Catecholamines can cause negative side effects such as skin ulcers and decreased blood flow to renal and mesenteric circulations, especially with prolonged use at high doses.
Induced hypothermia is associated with complications. Pneumonia rates as high as 40%–45% have been reported in hypothermia trials. Electrolyte disturbances, cardiac arrhythmias, shivering, hiccups, and increased intensive care unit length of stays have been reported in patients receiving induced hypothermia.
Complications of high-dose barbiturates include cardiac depression and hypotension.
Using fluids and vasopressors to aggressively raise CPP may cause pulmonary complications.
One study concluded that a reduction in the supply of glucose along with increased signs of metabolic distress may not be advantageous in an injured brain.
There is a high side-effect profile with chronic antiseizure prophylaxis.

Qualifying Statements

Qualifying Statements

The authors, editors, and publisher of this document neither represent nor guarantee that the practices described herein will, if followed, ensure safe and effective patient care. The authors, editors, and publisher further assume no liability or responsibility in connection with any information or recommendations contained in this document. These recommendations reflect the American Association of Neuroscience Nurses' judgment regarding the state of general knowledge and practice in their field as of the date of publication and are subject to change based on the availability of new scientific information.
As a result of the high profile of traumatic brain injury (TBI), particularly injuries that are blast-related, new medical, nursing, and rehabilitation treatments are frequently emerging. Resources and recommendations must describe the best practices that can enable neuroscience nurses to provide optimal care for adults with severe TBI. Accordingly, adherence to these guidelines is voluntary, and the

ultimate determination regarding their application must be made by practitioners in light of each patient's individual circumstances. This reference is an essential resource for nurses providing care to adults with severe TBI. It is not intended to replace formal learning, but rather to augment clinicians' knowledge base and provide a readily accessible reference tool.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Clinical Algorithm

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Safety

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

American Association of Neuroscience Nurses. Nursing management of adults with severe traumatic brain injury. Glenview (IL): American Association of Neuroscience Nurses; 2008. 20 p. [152 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2008 (reaffirmed 2012 Dec)

Guideline Developer(s)

American Association of Neuroscience Nurses - Professional Association

Source(s) of Funding

American Association of Neuroscience Nurses

Defense and Veterans Brain Injury Center

Guideline Committee

Not stated

Composition of Group That Authored the Guideline

Content Authors: Laura McIlvoy, PhD, RN, CCRN, CNRN; Kimberly Meyer, MSN, CNRN, ARNP

Financial Disclosures/Conflicts of Interest

The American Association of Neuroscience Nurses (AANN) requires that all planners, teachers, and authors involved in CNE make full disclosure indicating whether the individual and/or his/her family have any relevant financial relationships, now or within the 12 months preceding this event, with a commercial interest (e.g. pharmaceutical companies, biomedical device manufacturers, and/or corporations) whose products or services are discussed in the continuing education activity content over which the individual has control. All presenters participating in the AANN sponsored programs must complete this form and return it as indicated. All information disclosed is printed in the program materials.

The authors state no potential conflicts of interest.

Guideline Status

This is the current release of the guideline.

The American Association of Neuroscience Nurses reaffirmed the currency of this guideline in December 2012.

Guideline Availability

Electronic copies: Available from the American Association of Neuroscience Nurses Web site .

Print copies: Available from the American Association of Neuroscience Nurses, 4700 W. Lake Ave., Glenview, IL 60025.

Availability of Companion Documents

None provided

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on September 10, 2009. The information was verified by the guideline developer on September 29, 2009. The currency of the guideline was reaffirmed by the developer in December 2012 and this summary was updated by ECRI Institute on October 22, 2013.

Copyright Statement

This summary is based on the original guideline, which is subject to the guideline developer's copyright restrictions.

Disclaimer

NGC Disclaimer

The National Guideline Clearinghouseâ„¢ (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria which may be found at http://www.guideline.gov/about/inclusion-criteria.aspx.

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.